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BAG O' BONES: MANAGING THE UNDERWEIGHT HORSE

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Nothing is more frustrating than trying to get weight on a horse and seeing no results. Although putting weight on a horse may be accomplished simply by feeding more calories, the problem often requires a more thorough probe into what is causing static weight. The probable causes and changes in diet or management that will give the skinny horse every opportunity to gain weight are outlined here. The first part will discuss factors that may keep a horse from gaining weight or may cause a horse to lose weight. The second part will review methods of increasing calories in the diet to achieve weight gain.

Reasons for Weight Loss

Insufficient caloric intake is the primary cause of failure to maintain sufficient body condition in horses. A variety of reasons may account for caloric deficiency. Some are easy to pinpoint and simple to address, such as parasite loads or teeth problems. Others are impossible to diagnose without euthanizing the horse and performing a necropsy. Physical problems of the digestive tract account for many of these problems, but there may be psychological and environmental reasons as well.

PARASITES

Internal parasites can be a major contributing factor to weight loss or inability to put on weight, although severe cases of parasitism are not as common as in years past because of improved dewormers and deworming programs. The ravages of internal parasites can be disastrous for several reasons. First, parasites may compete directly for the nutrients inside the digestive tract. They may also cause damage to the intestinal lining, making it difficult to absorb nutrients. Damage to the intestinal lining can diminish production of enzymes needed to prepare food particles for absorption. Competition for protein by parasites can affect absorption of nutrients because some are dependent on protein to transport them through the intestinal lining. The damage can also cause swelling of the intestinal lining which can draw electrolytes, sugars, and amino acids (building blocks of protein) back

into the intestines to be eliminated with the manure. In older horses, wasting of muscle tissue may be a result of years of parasitic damage to the intestines, making it difficult for protein and other nutrients to be absorbed in adequate quantities. Therefore, the animal becomes protein deficient and starts to break down its own muscle tissue to supply protein for essential body processes. For this reason, diets formulated for senior horses typically have higher protein. An effective deworming program should keep parasites from being a reason for weight loss. Examination of fecal samples by a veterinarian will reveal the efficacy of a deworming program. Deworming strategies should be discussed with a veterinarian who is familiar with regional parasite populations.

TEETH

If a horse is not maintaining weight, the first thing that should be checked is the condition of teeth. Proper dentition is essential to a horse because of the nature of its diet. Horses evolved eating coarse roughage and plant materials that require thorough grinding by the molars to break down the particle size of the food. Enzymes and microbes of the gastrointestinal tract readily digest feedstuffs that have been crushed into minute particles. Problems with dentition can have deleterious effects on the body condition of a horse.

Perhaps the most common dental problem is irritation or laceration of the cheek, tongue, or gums by sharp edges or points of the teeth. Normal wear and tear induced by chewing can reshape the edges of the teeth, sometimes making them sharp enough to cut into the parts of the mouth they contact. This makes chewing painful. A horse with points will often reduce the quantity of feed consumed or will eat more slowly than normal. Pain caused by points can be alleviated by floating the teeth, a procedure in which a dental rasp is used to smooth sharp edges.

A dental problem particular to young horses is the presence of caps that will not dislodge appropriately. By the time a horse achieves maturity, it will have had two sets of teeth. Immature horses possess deciduous or milk teeth that are gradually replaced by permanent teeth. As permanent teeth erupt and grow, milk teeth are generally ousted. In some instances, a portion of a milk tooth, a cap, may remain. Caps can make chewing difficult and should be removed if discovered. Young horses that roll feed in their mouths and spill feed from their mouths should have their teeth inspected for the presence of caps.

Infections in gums or teeth, cracked or broken teeth, and poor mouth conformation (severe parrot mouth or undershot jaw) can also cause reduced feed intake. In aged horses, loss of molars is a primary concern when discerning a cause for weight loss. As time takes its toll on the horse, dentition can become wavy and teeth may start to fall out. When a horse does not properly grind his food because of molar loss or misalignment, the food enters the digestive tract in particles too large for proper breakdown by digestive enzymes in the small intestine

and microbes in the large intestine and cecum. If this is the case, feed is of little energetic benefit to the horse and weight loss will result. Receding incisors, another problem common in aged horses, may cause difficulty in tearing grass when grazing. Inadequate intake of forage will result. Aged horses that have spent a lifetime cribbing may be doubly prone to receding incisors. For these reasons many commercial senior feeds are designed to provide a complete diet, including forage, in small particle size. These feeds can be softened with water and made into gruel so they do not require any chewing to be of benefit to the horse.

Careful observation of the eating habits of a horse will likely reveal a dentition problem. Slow eating, reluctance to drink cold water, tilting the head while chewing, wallowing food around in the mouth before swallowing, balling up food in the mouth, and dropping food may indicate a tooth problem. However, some horses may not exhibit abnormalities in food intake or mastication but may still be losing weight from a chronic tooth ailment. Most equine veterinarians are knowledgeable in proper dental care and can perform a thorough examination of the mouth. In areas of the country with exceptionally large horse populations, an equine dentist may be available to diagnose and alleviate dental quandaries. If the problems are permanent (as in tooth loss), adjustments of the diet should be made to address the problem.

DIGESTIVE TRACT PROBLEMS

Any physiological problem that keeps food from getting to the intestines for absorption can cause weight problems. If swallowing is painful or difficult, the horse will not want to eat. Things that may cause problems with swallowing could be nerve damage from equine protozoal myelitis (EPM), obstructions from abscesses or strangles, and muscle weakness caused by hyperkalemic periodic paralysis (HYPP) or botulism. Partial esophageal obstruction can occur from abnormal growths, scar tissue from an episode of choking, or a foreign object lodged in the throat. Esophageal obstruction narrows the passageway for food, making it difficult for the horse to swallow. Horses that have chronic choke may have an esophageal obstruction that instigates the problem. The only way to effectively diagnose esophageal narrowing is by endoscopic exam or x-ray. If there is no way to clear the obstruction, dietary adjustments should be made so that the type of food offered is easily swallowed.

Gastric ulcers can cause reduced appetite in horses because of a painful or uncomfortable stomach. The end result is a horse who is not able to consume enough calories to maintain weight. The incidence of ulcers in horses is surprisingly high. Surveys done on performance horses have found ulcers in about 80% of racehorses in training and as many as 50% in other types of performance horses. Horses that live on pasture most of the day rarely develop ulcers. Gastric ulcers develop in the horse when the acidity of the stomach is too high. The main precipitants for gastric ulcers in horses are a high grain and low forage diet, meal

feeding instead of continuous forage availability, overtraining, and other stresses of a performance schedule. Signs associated with gastric ulcers are irritability, picky eater, chronic colic, diarrhea, and inability to gain weight. Some horses have all of the signs, some have only one, and some do not exhibit any, yet have the problem. Medications have been developed to help heal gastric ulcers, and antacids are currently being marketed to prevent gastric acid accumulation in the stomach. Antacids can also be used to prevent ulcers from occurring or recurring.

Problems that can occur in the small intestine, large intestine, and cecum may influence the nutrient absorption. Chronic diarrhea can contribute directly to weight loss because nutrients move too quickly through the digestive tract, thereby escaping absorption. There are many causes of diarrhea in the horse. Countless bacteria reside in the equine digestive tract, and a delicate balance exists between bacterial types. If the balance of the different types shifts, the ecosystem in the hindgut can disintegrate. Dysfunction of the bacteria may result in the inability of digesta to be broken down into small enough particles for absorption. Inadequately digested feed often results in diarrhea. Viruses can also disrupt the health of the bacterial population of the hindgut and cause detrimental effects. Viral and bacterial pathogens can induce damage and sloughing of the intestinal lining.

No magic potion is marketed which will return the bacterial population of the hindgut to a state of normalcy, but there are a few products that may help. Probiotics are frequently used to help repopulate the gut with beneficial bacteria. One old-fashioned probiotic recipe called for a bucket of feces from a healthy horse mixed with water. The preparation was then given to the horse through a nasogastric tube. Today, there are neater, but not necessarily more effective, ways to rebalance the microbe population of the hindgut. Endurance enthusiasts have been known to feed yogurt with live cultures to their horses for the probiotic effect. Commercial probiotic pastes or liquids with *Lactobacillus* and/or *Streptococcus faecium* are available, as are bagged products with yeasts and probiotics designed as daily supplements. Probiotics are very useful when a horse has been stressed by trailering, change of home, deworming, or antibiotic treatment. When there is no apparent reason for a horse to have a problem putting on weight, sometimes just the addition of probiotics and yeast supplement to the diet will bring the horse around.

DISEASE

Chronic and acute disease can interfere with the horse's ability to maintain weight. Many diseases affect the body by disturbing protein use. Without proper amounts of protein, the body cannot rebuild damaged tissues, make transport proteins that carry other nutrients through the blood to target sites, make clotting factors for blood, and carry on a host of other physiological functions. When the body cannot get enough protein from the diet, it begins to break down the existing protein in the body to use for its most important functions. Muscle is the most abundant storehouse of protein in the body. Muscle wasting is an indicator of protein

deficiency, either from dietary inadequacy or disease interfering with protein utilization.

Chronic liver disease may result in weight loss due to the decreased ability to handle protein and fat properly. Normally, dietary protein and fat make their way to the liver after being absorbed from the intestines into the blood or lymphatic system. The liver acts as the master coordinator for nutrients, directing amino acids and fatty acids to fulfill assignments elsewhere in the body. When the liver is not functioning properly, many other systems in the body are affected with the end result of weight loss. Liver function can be assessed with a simple blood chemistry analysis.

Malfunctioning kidneys may also cause weight loss. Acute or chronic kidney disease can result in protein loss in the urine. Horses with kidney problems will usually drink excessive amounts of water and urinate frequently. Kidney function can also be assessed with a simple blood chemistry.

Certain problems occurring in the body will result in an abnormal increase in the distribution of energy usually necessary for normal body processes. Abscesses within the body cavity will rob large amounts of energy from the horse, resulting in chronic weight loss. Cancer has the same effect on metabolism. Horses with chronic obstructive pulmonary disease (COPD) burn more calories than horses with normal breathing patterns because of the physical effort required to breathe. Pituitary adenoma (Cushing's syndrome) also can place metabolism in high gear, burning the body's energy stores excessively. Common ailments such as a heart murmur can cause problems because of the disruption of blood flow that carries nutrients throughout the body.

ENVIRONMENT

Horses are like humans in the sense that environment may affect appetite. An uncomfortable or unhappy horse may prefer to indulge in a stable vice such as cribbing, weaving, or stall walking, thereby wasting valuable calories. The result is detrimental to the horse's ability to maintain weight. The ideal solution is to find out what the horse does not like about the environment. This is often challenging to find or, if found, impossible to change. The next best approach is to increase the caloric density of the diet.

Herd dynamics may account for poor condition and is frequently the cause in pasture or lot environments. Horses low in the pecking order will be granted only limited access to feed by horses higher in the social hierarchy. Timid horses will waste away rather than fight for a chance at the food if it is hoarded by the more dominant horses in a group. In group feeding situations, generous space should separate piles of hay. If grain is group fed, the grain buckets or feeders should also be spaced accordingly. Providing one or two extra servings of hay or grain to the group may be beneficial because less dominant horses will have more options from which to choose should they be intimidated by another horse.

Chronic pain is often overlooked as a cause of weight loss in horses. The body's response to pain is the release of adrenaline (epinephrine), which puts the body in a state of catabolism. Catabolism causes the breakdown of body energy stores that ultimately results in chronic weight loss. The discomfort can also dampen the appetite of the horse.

Numerous causes can account for a horse's inability to maintain weight aside from not consuming sufficient calories. Quick and easy solutions cure some problems, but for other problems there may be no solution but to deal with the animal as it is.

Putting Weight on the Horse

Sometimes, getting a thin horse to gain weight is simply a matter of increasing the caloric density of the diet. Other times, the diet may need to be higher in calories because of a medical, psychological, or environmental problem. Various strategies for increasing calories in the equine diet can be adapted to meet the needs of the horse.

HARD KEEPERS

The metabolic rate determines whether a horse is an easy or hard keeper, and the variation between horses can be extreme. Metabolism is the speed at which the body burns fuels for energy in order to maintain normal body functions. A slow metabolism is one that can function on little input of fuel energy. Conversely, a fast metabolism is one that needs a higher caloric intake in order to function properly. In general, members of certain breeds have faster metabolisms and need more food to maintain body condition than members of other breeds. For example, Thoroughbreds usually eat more per pound of body weight than draft horses. There is also variety within a breed. For instance, some Thoroughbreds are easy keepers while others require intense management to maintain body weight. Temperament often goes hand in hand with metabolic rate. A nervous horse may require more calories than a calm-tempered one to maintain the same body condition. A tense horse may spend more time stall walking or weaving while the calm horse conserves energy stores.

A thin horse requires energy in the diet to ensure proper functioning of body processes and to build fat stores. Energy is a general term, yet many horsemen associate the word energy with mental energy. In this article, energy refers to the potential of a feed to fuel body functions and exercise. Weight gain in the horse can be attributed to protein or fat deposition. When a horse does not have enough calories or protein in the diet, the body will break down its own muscle tissue and deplete much of the adipose tissue or fat. This results in emaciation with poor muscle definition and protruding bones. When the diet has excessive calories, the body will build muscle and adipose stores. The simple solution to low weight is to

increase the caloric content of the diet while ensuring adequate protein content. The three nutrients that can supply energy to increase the caloric content of the diet in the horse are fiber, starch, and fat. Each nutrient is utilized for energy in a slightly different way in the body, which, depending on the horse, can be advantageous or not.

FIBER

Of the three major energy sources for the horse, fiber is the most important, most underestimated, and the safest. Fiber is the major component of grass and hay. Some horses can maintain their weight on fiber sources alone. For the hard keeper, however, fiber alone will not maintain weight, but there are fiber-feeding strategies that can increase the ability of the horse to derive energy from fiber.

The fiber portion of a plant consists primarily of cellulose, hemicellulose, and lignin. Residing in the intestinal tract of the horse (cecum and colon) are billions of microbes that break down the fiber into a physiological usable form, volatile fatty acids. These volatile fatty acids pass into the bloodstream of the horse where they can be transported to sites that need energy or tucked away as energy stores in the form of adipose tissue or muscle glycogen. Most of the cellulose and hemicellulose (digestible fiber) is easily digested by intestinal microbes. The lignin is not digestible (indigestible fiber). Therefore, as lignin content of a feed increases, digestibility decreases. As digestibility plummets, less energy is available to the horse. Lignin is the carbohydrate that gives the most structural support to a plant; rigid-stalked vegetation will contain more lignin than limp-stalked plants. For instance, there is little lignin in the soft leaves of the alfalfa plant, but a much higher content of lignin is present in the rigid stem. If there are more leaves and fewer stems, or if the stems have not matured to become stiff and inflexible, the digestible fiber portion of the hay will be higher. A young plant harvested prior to maturity will have a lower lignin content than a plant allowed to mature before cutting. Fresh spring grass is much higher in digestible fiber than parched summer grass. A horse can derive more energy from a high-quality, early harvested hay (whether grass or legume) than a mature hay. Pasture is also a source of fiber. The digestibility of pasture is usually higher than hay, because the curing process of haymaking results in digestible fiber losses.

When comparing the energy content of alfalfa and grass hays, alfalfa hay can provide a horse with more energy than grass hay of similar quality. On the other hand, a low-quality alfalfa hay which is composed of more stem than leaf is not a rich source of energy. More energy could be provided with a grass hay that has very little stem and an abundance of visible green grass blades. Maximizing forage quality should be the first dietary adjustment when trying to achieve weight gain.

When quality fiber in the form of pasture or hay is not available, or if the horse does not readily eat hay, there are alternative fiber sources that may add energy to the diet. The most common are beet pulp, soy hulls, wheat bran, and

alfalfa pellets or cubes. Beet pulp is about 80% digestible fiber (as compared to 50% for the average hay). Soy hulls are a by-product of soybean production. Soy hulls are the skin of the bean (not the husk or pod) that is knocked off before oil is extracted from the bean. Commonly used in commercial horse feeds, soy hulls are slightly lower in digestibility than beet pulp. If a commercially designed horse feed has soy hulls listed as one of the primary ingredients, it will be a good source of highly digestible fiber.

Wheat bran is commonly thought of as a fiber source, but it actually has about the same amount of fiber as oats. Wheat bran is a rich energy source because it is abundant in digestible fiber and starch. Wheat bran contains a large quantity of phosphorus, which can potentially disrupt the calcium and phosphorus ratio in the diet. On the flip side, wheat bran complements a diet high in alfalfa hay, which is usually rich in calcium.

When good-quality forage is unavailable or if hay intake is minimal or difficult for a horse, the diet of the horse can be supplemented with alfalfa pellets or cubes. Both products are made with alfalfa that has been harvested when digestible fiber is at its peak. Thus, alfalfa pellets and cubes provide energy to the horse. Alfalfa hay is often combined with timothy hay or whole corn plants to create cubes lower in protein and calcium content than pure alfalfa cubes. A word of caution when feeding pellets: some hay should still be fed if possible because of the important laxative effect of long fiber in the diet.

Supplements are available that may help with fiber digestion if the horse has a problem with the balance of microbes in the cecum or colon. Yeast has been researched and found to improve fiber digestibility. Some commercial feeds come with yeast already added, and yeast products can be top-dressed. Probiotics are also thought to help improve fiber digestibility. Because the microbial population in the hindgut can shift out of balance, researchers believe the addition of more bacteria in the form of a probiotic restores bacterial stability, thereby improving digestion of forage. Some commercial products are available that combine yeast and a probiotic for maximal regeneration and efficiency of the microbial population.

STARCH

When a horse cannot maintain weight on hay or grass alone, the addition of starch in the form of grains has been the most traditional method of increasing the energy density of the diet. Obtaining energy from starch is actually more efficient because it is a simple enzymatic process. The end result is having to feed fewer pounds of grain than hay to supply the equivalent amount of energy to the horse. Grains are an excellent source of starch for the horse, but they can be hazardous to the digestive tract.

The starch molecules found in grains are complex polysaccharides which, when attacked by the enzyme amylase in the small intestine, can be broken down to

very simple sugars which are easily absorbed into the bloodstream. From there, the sugars in the blood are distributed to where they may be needed by the body for energy or they may be stored as muscle glycogen or adipose tissue for future use.

The limiting factor to starch digestion in the horse is the production of amylase in the intestinal tract. Amylase production has been found to be quite variable among horses. Without sufficient amylase in the intestinal tract, much of the starch in the diet passes through to the large intestine where it is fermented. This is undesirable for two reasons. The amount of energy produced from starch by fermentation is less than the amount produced by enzymatic activity, and excessive fermentation of starch drops the pH of the hindgut which will decrease the efficiency of the bacteria which digest fiber and produce energy.

To further complicate the situation, not all starch molecules are created equal. Studies have shown that the oat starch molecule is small and easily digested by amylase. On the other hand, the starch molecules of corn and barley are large and not easily digested. Heating corn or barley changes the nature of the starch molecule and makes it more easily digested by amylase. Therefore, it is better to feed steam rolled or cooked barley and steam flaked or super flaked corn than their untreated counterparts. The process of pelleting involves heat that results in improved enzymatic digestion of corn; extruding improves it even more. When deciding on a commercial mix for the horse, look for one that uses grains that have been processed to allow for optimal digestion in the small intestine of the horse.

While grain is a concentrated source of energy for the horse, there are some inherent dangers with feeding excessive amounts. When desperately trying to get a difficult horse to gain weight, it is often tempting to keep increasing the amount of grain being fed. Unfortunately, there is a point of no return when a horse gets too much grain in its digestive tract and the delicate balance of the microbial population is thrown off kilter. At this point, many horses also lose their appetite for forage and the situation worsens. No matter how much grain you feed, the horse will probably lose more weight. The minimal amount of forage a horse requires is 1% of its body weight. Therefore, a 1000-pound horse needs a minimum of 10 pounds of hay per day in order to maintain a reasonable balance of the microbial population. The rest of the diet should be designed around the minimal forage requirement.

The danger of feeding too much starch occurs because certain horses have a sensitivity to starch overload, perhaps precipitated by low amylase production. The cascade of problems begins with too much grain passing from the small intestine to the cecum and colon. Starch in the grain is fermented by bacteria inhabiting the cecum and colon. The by-product of starch fermentation is lactic acid, a substance that alters the pH of the hindgut to be more acidic. The acidic environment kills the bacteria. As the bacteria die they produce endotoxins that can cause colic. The endotoxins that pass into the bloodstream cause blood vessels to constrict. This decreases blood flow to the sensitive laminae in the hoof, which

can induce laminitis. Horses that suffer from starch sensitivity should not be given high-grain diets.

As with forage digestion, supplements designed to aid in starch digestion or utilization have been developed. Although there has not been definitive research performed on the benefit of adding enzymes to the diet, the theory is well founded. If amylase is the limiting factor in small intestinal grain digestion, adding amylase to the feed may reduce the amount of grain channeling into the cecum and colon. Although there are a few feeds and supplements containing enzymes on the market, their efficacy is still questionable. Enzymes are proteins that are sensitive to acidic environments. Such environments denature the enzymes thereby making them inactive. All feed passes through the acidic stomach before reaching the small intestine; so how much enzyme will actually reach the intestine intact and not be denatured? More research is necessary to establish the efficacy of feeding supplemental enzymes.

Supplemental chromium may improve the metabolism of starch. The action of chromium does not have as much to do with aiding digestion as it does with the way the body handles the rise in blood glucose resulting from starch digestion and the consequential rise in insulin. Chromium yeast has been effective in reducing the incidence of chronic founder in some ponies and the incidence of chronic tying up in some horses with intolerance to high-grain diets.

FAT

Almost all performance horses have some type of fat added to their diet, whether it is a slug of corn oil, a scoop of rice bran, a handful of linseed, or a commercial high fat feed. Traditionally, fat was added to give the coat a healthy shine. However, recent research has brought to light an even better reason for feeding fat – it is an excellent energy source. Added dietary fat has proven to be an invaluable tool for packing weight on a hard keeper. Feeding fat is advantageous for several reasons. It is more concentrated, energy from fat does not make a horse flighty as energy from grain can do, and horses on high-fat diets exhibit more endurance.

Differences among fat sources make some more useful than others under different circumstances. There are major differences between vegetable fats (oils) and animal fats. The primary disadvantage of feeding animal fats is palatability; oils are much more appealing to the horse, although many commercial animal fats have flavorings added to improve the taste. Corn oil typically has remained the star in palatability studies, but most oils are palatable when offered without corn oil as a choice. The second obstacle is digestibility. Animal fat is only about 75% digestible while oil is closer to 95%. With small intakes of animal fat the digestibility difference is insignificant, but when higher levels are fed, that portion of indigestible fat can start to play havoc with the balance of microbes in the hindgut. Loose, runny feces are a sign that improper fat digestion is occurring.

A third obstacle involves the long-term maintenance of horses on animal fat. Horses may tire of the flavor and go off of an animal fat product before refusing a vegetable oil.

Other common sources of fat include rice bran, linseed, sunflower seeds, full-fat soybeans, and coconut meal (copra meal). Rice bran is an excellent product for improving body condition of thin horses because it is a good combination of rice oil and highly digestible fiber. Rice bran can be added to the regular grain to increase the caloric density of the ration. Linseed, sunflower seeds, and other seeds provide fat in the diet. However, a notable problem does arise when feeding vast amounts of seeds. As quantities of seeds fed increases, consumption will frequently slow, sometimes to the point of total refusal. Roasted soybeans are also great in small quantities but will increase the protein percentage of the diet too much if fed in larger amounts.

A high-fat diet is an invaluable tool for achieving weight gain in a skinny horse as long as the gastrointestinal tract of the horse will tolerate the fat. Normally horses have no problem digesting fat as long as it is introduced gradually into the diet. The greatest advantage of using fat as an energy source is that it helps to avoid excessive intakes of grain. Dietary fat works best when fed in conjunction with grain and/or highly digestible fiber sources like beet pulp (not neglecting good-quality hay or pasture). Many new feeds are appearing on the market that incorporate high fat levels (>6%) with high-fiber ingredients like beet pulp or soy hulls.

Conclusion

Some horses are metabolically inclined to be hard keepers while others have medical, psychological, or environmental reasons for having difficulty in maintaining weight. Increasing the caloric intake of a horse is not problematic if careful attention is paid to the feedstuffs offered to the horse. Manipulation of the amount and variety of energy sources will often achieve ideal body condition for the hard keeper.